

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) A polarization conversion optical system for converting light having a nonuniform plane of polarization to light having a uniform plane of polarization, comprising:

a dielectric multilayer film having a different incidence angle dependency relative to a first polarized light component and a second polarized light component which have mutually intersecting planes of polarization, ~~so as~~ wherein the dielectric multilayer film is configured to transmit light of the first polarized light component at a first incidence angle, and reflect light of the second polarized light component at a ~~the first incidence angle, and~~ transmit light of the second polarized light component at a second incidence angle different from the first incidence angle;

a reflecting element ~~for reflecting~~ configured such that light entering the dielectric multilayer film at said first incidence angle and transmitted through the dielectric multilayer film is reflected from the reflecting element so as to impinge the dielectric multilayer film at an angle equal in magnitude to said second incidence angle; and

a quarter-wavelength plate positioned medially to the dielectric multilayer film and the reflecting element,

wherein, for incident light impinging on the dielectric multilayer film at the first incidence angle and comprising light having a first polarization direction and light having a second polarization direction:

light of the first polarization direction incident on the dielectric multilayer film at the first incidence angle is transmitted through the dielectric multilayer film,

light of the second polarization direction incident on the dielectric multilayer film at the first incidence angle is reflected from the dielectric multilayer film,

the transmitted light of the first polarization direction is reflected at the reflecting element and is converted to converted light having the second polarization direction by passing through the quarter-wavelength plate twice, and

the converted light having the second polarization direction is transmitted through the dielectric multilayer film at the second incidence angle,

such that the reflected light of the second polarization direction and the converted light having the second polarization direction emerge from a same side of dielectric multilayer film.

2. (Original) The polarization conversion optical system claimed in Claim 1, wherein the reflecting element is a reflecting-type diffraction element.

3. (Original) The polarization conversion optical system claimed in Claim 1, wherein the transmittance of the first polarized light component at the first incidence angle of the dielectric multilayer film is 99% or higher, and the reflectivity of the second polarized light component at the first incidence angle is 99% or higher,

and the transmittance of the second polarized light component at the second incidence angle is 95% or higher.

4. (Original) The polarization conversion optical system claimed in Claim 1, wherein the difference between the first incidence angle and the second incidence angle is 30° or less.

5. (Original) The polarization conversion optical system of claim 1, wherein said dielectric multilayer film comprises alternating layers of a first material containing SiO₂ and a second material containing TiO₂ and La₂O₃.

6. (Currently Amended) A polarization conversion element comprising:
a dielectric multilayer film having a different incidence angle dependency relative to a first polarized light component and a second polarized light component which have mutually intersecting planes of polarization, ~~so as~~ wherein the dielectric multilayer film is configured to transmit light of the first polarized light component at a first incidence angle, and reflect light of the second polarized light component at a
the first incidence angle, and transmit light of the second polarized light component at a second incidence angle different from the first incidence angle;

a reflecting-type diffraction element ~~for reflecting~~ configured such that light entering the dielectric multilayer film at the first incidence angle and transmitted through the dielectric multilayer film is reflected from the reflecting-type diffraction element so as to impinge the dielectric multilayer film at an angle equal in magnitude to the second incidence angle; and

a quarter-wavelength plate positioned between the dielectric multilayer film and the diffraction element,

wherein the dielectric multilayer film, quarter-wavelength plate, and diffraction element are integral with one another, and

wherein, for incident light impinging on the dielectric multilayer film at the first incidence angle and comprising light having a first polarization direction and light having a second polarization direction:

light of the first polarization direction incident on the dielectric multilayer film at the first incidence angle is transmitted through the dielectric multilayer film,

light of the second polarization direction incident on the dielectric multilayer film at the first incidence angle is reflected from the dielectric multilayer film,

the transmitted light of the first polarization direction is reflected at the reflecting-type diffraction element and is converted to converted light having the second polarization direction by passing through the quarter-wavelength plate twice,
and

the converted light having the second polarization direction is transmitted through the dielectric multilayer film at the second incidence angle,

such that the reflected light of the second polarization direction and the converted light having the second polarization direction emerge from a same side of dielectric multilayer film.

7. (Original) The polarization conversion element claimed in Claim 6, further including a substrate disposed between the dielectric multilayer film and the diffraction element.

8. (Previously Presented) The polarization conversion element claimed in Claim 6, wherein the diffraction element is formed on a surface of the quarter-wavelength plate, and the surface of the quarter-wavelength plate functions as the diffraction element.

9. (Original) The polarization conversion optical system of claim 6, wherein said dielectric multilayer film comprises alternating layers of a first material containing SiO_2 and a second material containing TiO_2 and La_2O_3 .

10. (Currently Amended) A polarization conversion optical system, comprising:

a dielectric multilayer film ~~that reflects~~ configured to reflect light of one polarization component ~~of incident light~~ at a first angle of incidence, ~~and transmits~~ transmit light of another polarization component ~~of light~~ at said first angle of incidence, and ~~that transmits~~ transmit light of said one polarization component ~~of light~~ at a second angle of incidence different from the first angle of incidence;

a quarter-wavelength plate that transmits light passing through said multilayer film; and

a reflector disposed at a side of said quarter-wavelength plate opposite said multilayer film ~~that receives~~ configured such that light passing through said film and said quarter-wavelength plate at said first angle of incidence ~~and reflects said received light~~ is reflected from the reflector back through said quarter-wavelength plate and said film at an angle equal in magnitude to said second angle of incidence,

wherein, for incident light impinging on the dielectric multilayer film at the first angle of incidence and comprising light having a first polarization direction and light having a second polarization direction:

light of the first polarization direction incident on the dielectric multilayer film at the first angle of incidence is transmitted through the dielectric multilayer film,

light of the second polarization direction incident on the dielectric multilayer film at the first angle of incidence is reflected from the dielectric multilayer film,

the transmitted light of the first polarization direction is reflected at the reflector and is converted to converted light having the second polarization direction by passing through the quarter-wavelength plate twice, and

the converted light having the second polarization direction is transmitted through the dielectric multilayer film at the second angle of incidence,

such that the reflected light of the second polarization direction and the converted light having the second polarization direction emerge from a same side of dielectric multilayer film.

11. (Original) The polarization conversion optical system of claim 10, wherein said reflector comprises a diffraction grating.

12. (Original) The polarization conversion optical system of claim 11, wherein said diffraction grating is integrally formed on said opposite side of said quarter-wavelength plate.

13. (Original) The polarization conversion system of claim 11, wherein said diffraction grating is formed in an element that is distinct from said quarter-wavelength plate.

14. (Original) The polarization conversion system of claim 10, wherein said reflector is a planar mirror.

15. (Original) The polarization conversion optical system of claim 10, wherein said dielectric multilayer film comprises alternating layers of a first material containing SiO_2 and a second material containing TiO_2 and La_2O_3 .

16. (Canceled)

17. (Canceled)

18. (Canceled)

19. (New) The polarization conversion optical system claimed in Claim 1, wherein the dielectric multilayer film and the quarter-wavelength plate are mutually parallel.

20. (New) The polarization conversion optical system claimed in Claim 6, wherein the dielectric multilayer film and the quarter-wavelength plate are mutually parallel.

21. (New) The polarization conversion optical system claimed in Claim 10, wherein the dielectric multilayer film and the quarter-wavelength plate are mutually parallel.